
JPL

# SIRTF: Progress/Status Report

*Presented to Origins Subcommittee by:*

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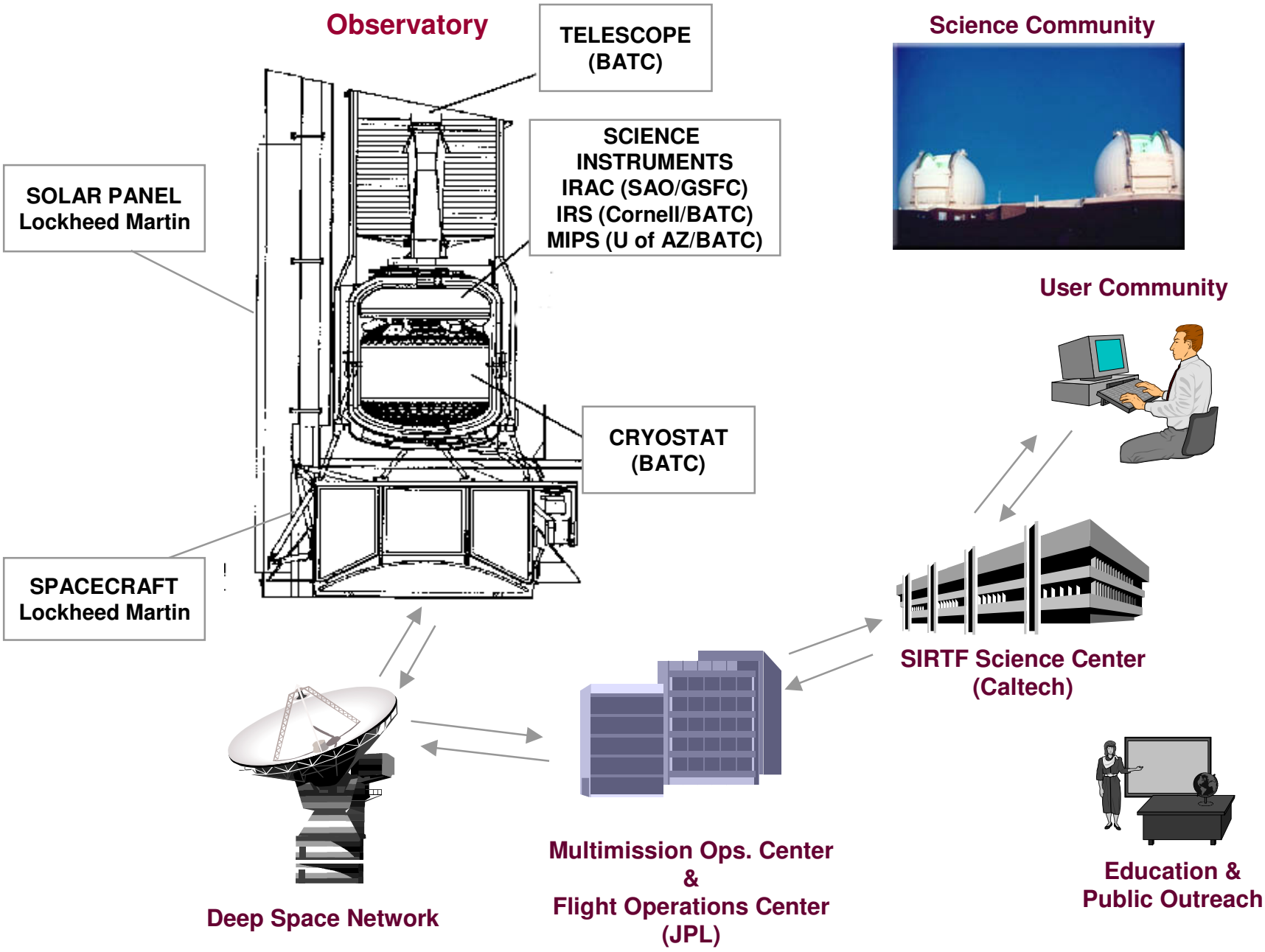
*(http://sirtf.caltech.edu/SSC/)*

**June 6, 2002**

# SIRTF System Architecture and Team Members



# The SIRTF Observatory

(Integrated at Lockheed-Martin Sunnyvale, April, 2002)

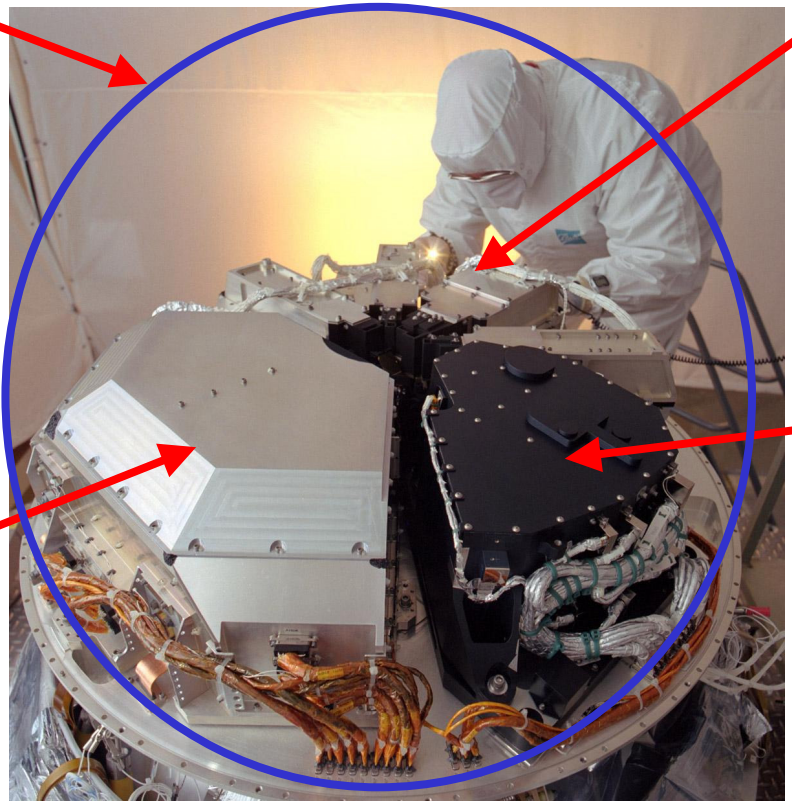
# Payload Status – June 6

## Payload

- All three instruments meet all level 1 requirements
- Instruments have been integrated and operated extensively at observatory level
  - *All command and telemetry paths have been verified*
- New power dissipation values provide nominal lifetime extension to ~ 5.9 years

## MIPS

- Several wiring anomalies resolved [also for IRAC]
- Remaining issues
  - ~18k short to ground, shown to have minor impact (factor of 2 signal loss over 3% of array)
  - Software commanded post-launch mitigation available if needed
  - Unexpected noise seen during EMI/EMC setup shown to be due to operation at much higher than flight temperature; lab tests are underway to verify diagnosis



## IRS

- Long Low Filter remains stable (60-80% of nominal transmission)

## IRAC

- Instrument stability very good
- New shutterless calibration methodology has been developed
- New J-Box has been installed and tested

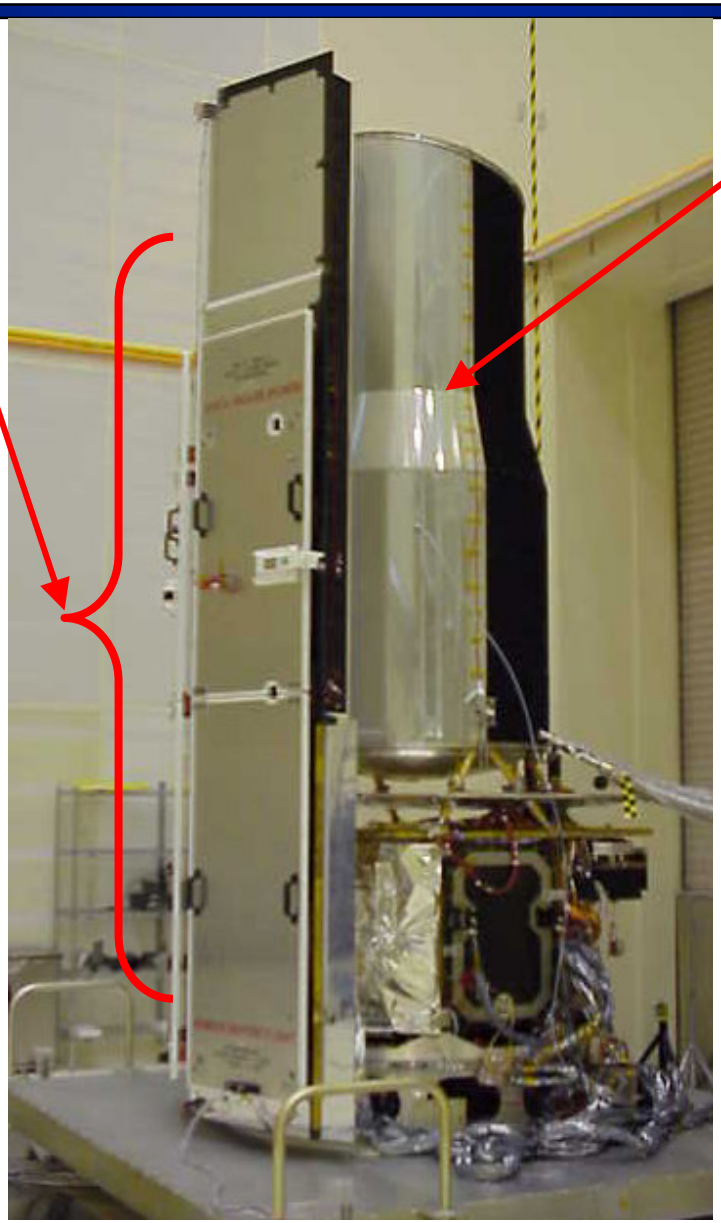
# Observatory Status – June 6

## Observatory

- Integration complete
- EMI/EMC testing complete
- Acoustic testing complete
- First end-to-end operations test with observatory completed
- Preparations for thermal vac test underway

## Facility

- ATLO schedule challenging
  - ~22 days of funded schedule reserve remain
- On track for launch on January 9, 2003



## CTA

- Instruments are confocal
- End-to-End image quality meets level 1 requirements.
- Thermal/Cryo performance consistent with >5+yr nominal lifetime

## Spacecraft

- Flight software completed & working on observatory
- Hardware completed and integrated
- Residual concern: reaction control thruster leaks
  - 2 of 12 thrusters have experienced low level leaks
  - Current leak rates do not limit SIRTF nominal lifetime
  - Extensive retest to precede thermal vac

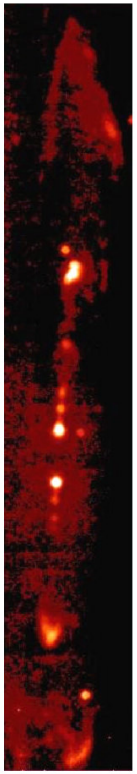
# SIRTF Science/Ops Planning

- **Major Mission and Science Operations Reviews going on as we speak**
- **Intense focus on IOC & Science Verification planning across the project**
  - ***IOC sequences being developed to run on test lab and on flight system***
- **First mission scenarios run quite successfully on the flight system**
  - ***Details to follow***
- **GTO's have input revised science programs to the SSC data base, with priorities indicated for first six months and first year**
  - ***Tests of SIRTF observation scheduling underway – instrument campaigns defined***
- **Short list of possible SIRTF names submitted to HQ**
- **About 50 candidate Early Release Observations have been proposed by all elements of the SIRTF community**
  - ***Example to follow***
  - ***Selection/prioritization is underway***
- **SSC continuing to work well with the Legacy Teams**
- **SSC starting to prepare documentation for first GO call**

*Space Infrared Telescope Facility*

# Sample ERO Nomination – SIRTF in the New York Times

The New York Times
ON THE WEB



NASA, via Associated Press

April 16, 2003

## NASA NEWEST FAR-INFRARED TELESCOPE UNVEILS STAR BIRTH FIREWORKS

By REUTERS

NASA's newest great space observatory, SIRTF, has revealed an image of a machine-gun-like jet created by a forming star. The image shows a magnificent and detailed picture of one of the most symmetric jets arising from a protostar, the so called Herbig-Haro 212 object.

"Stars are born within dense clouds of gas and dust and are invisible at optical wavelengths. Embedded objects like this one are only detected at longer wavelengths, and they are perfect to be observed with the state of the art infrared detectors on board SIRTF" said Tom Soifer, director of the SIRTF Science Center. "All of us are fascinated by the process that creates stars like our own Sun. Stellar jets are a common signature of the star formation process. They are like 'light beacons' of billions of miles in size, which are telling us where precisely these type of stars are being formed", commented Dr. Mike Werner, SIRTF project scientist at the Jet Propulsion Laboratory.

Outflows are fascinating objects, since they characterize one of the most energetic phases of the formation of low mass stars, i.e. stars that after some hundred of thousands of years will look like our Sun. The jets arising from these protostars can reach sizes of trillions of miles and velocities of hundreds of thousands miles per hour. Outflows are clear evidence of the presence of a collimation process that creates supersonic beams of gas. This mechanism is tightly bound to presence of circumstellar disks that surrounds the young stars, and these disks are likely to be the progenitors of proto-planetary systems. Our Sun probably underwent through a similar process some 4.5 billion years ago, hence the interest to understand how quickly and efficiently this mass loss process occurs.

"The SIRTF images in the far-infrared are truly opening a new window in the star formation research, and it will take a long time before they can be overshadowed by a better technology", said Dr. Jocelyn Keene, researcher at the Jet Propulsion Laboratory.

HH 212 is the best example of a symmetric Herbig-Haro jet. Although the theory predicts that a bipolar flow is made of a pair of jet/counter-jet system ejected from the protostar, in most optically detected jets one observes only one "jet-pole". This is due to the fact that the glowing gas is partially obscured by the surrounding dust and dense molecular gas. Only at longer wavelengths, like the infrared, one begins to get a complete picture of these objects and their interaction with the interstellar medium.

"As amazing and beautiful the image is, this is only the tip of the iceberg. We expect to discover more systems like HH 212 as soon as our Legacy Survey of molecular clouds starts. With SIRTF, we can penetrate deep into the cloud's dense molecular gas and dust, due to the superb sensitivity of its infrared detectors", said Dr. Neal Evans, member of the ERO team.

The SIRTF telescope was successfully launched on January of this year, and is currently in its Science Verification phase. The HH 212 images were obtained with the infrared camera (IRAC) and the far-infrared photometer (MIPS) lead by Profs. Giovani Fazzio and George Rieke, respectively.

The above cartoon of a press release summarizes why jets and outflows can be considered worthy candidates as EROs. They are related to the formation of stars like our Sun. Their sizes and velocities are huge for human standards, but still it is possible to refer to them in miles and mph. Since the jet collimation process is intimately related to circumstellar disks, a key element of the formation of planetary disks, the jets place this active evolutionary phase as a precursor to the creation of our own Solar System. The above image is an unpublished NICMOS observation in H2 at 2.12 microns convolved with the IRAC 8um PSF from TinyTim. IRAC band pass at this wavelength includes the (0,0) S(3) 9.66um, the strongest H2 line as detected in these objects by ISO. HH 212 is likely to look much better than my simulation. The image will be even more impressive when combined with the MIPS images at 24 and 70um of the warm dust emission.

# Summary of SIRTF Scenario Testing

- **Successful end-to-end test with flight hardware**
- **Executed sequences generated using the Ground data system that represent real observations and engineering activities**
  - ***Sequences generated at SSC and processed at JPLMission Ops***
  - ***Sent to observatory and executed on flight hardware***
  - ***Pointing system interactions simulated with closed loop test set***
  - ***Spacecraft engineering activities also simulated***
  - ***Data returned through JPL Mission Ops to SSC for analysis***
- **Top level results**
  - ***Over 30 hours of sustained automated operation***
  - ***All instrument transitions executed properly***
  - ***IRAC and IRS sequences executed in toto; one MIPS function was deferred***
  - ***Modest number of known and new anomalies noted and being worked on***
- **A full seven day autonomous operation sequence to be run at least once in subsequent ground test**
  - ***Retest opportunity is in schedule as well***

# Status Summary & The Next Steps

- **The successful integration of the SIRTF observatory brings the January 2003 launch date within reach**
- **The predicted scientific performance of the as-built SIRTF is consistent with expectations**
- **Successful completion of scenario testing indicates that SIRTF operations will be understood at launch**
- **More than 75% of the observing time on SIRTF is to be used by the general community**
  - ***The first General Observer Call will be released November 2002, with proposals due at L+5 months [June, 2003]***
- **Stay abreast of our website, sirtf.caltech.edu/SSC/, for new developments**